

### **REMARKS**

Applicant respectfully requests reconsideration. Claims 1-89 were pending in this application. Claims 1, 7-11, 13, 28-30, 62, 64, 77, and 83 have been amended. Claims 6, 33, 37-61, 65-76, 78-82, and 86-89 have been cancelled. New claims 90-109 have been added. As a result, claims 1-5, 7-32, 34-36, 62-64, 77, 83-85, and 90-109 are now pending in this application. No new matter has been added.

### **Claim Objections**

Claim 10 is objected to for lack of antecedent basis. As requested by the Patent Office, claim 10 has been amended to address this issue.

Claim 64 is objected to for improper use of the English language. As requested by the Patent Office, claim 64 has been amended to address this issue.

Accordingly, Applicants respectfully request withdrawal of the claim objections on these grounds.

### **Rejection of Claims under 35 U.S.C. §102**

Claims 1, 2, 4, 5, 15-17, 29, 30, 33-36, 83 and 84 are rejected under 35 U.S.C. §102(e) as being anticipated by Kopf-Sill et al., U.S. Patent No. 6,858,185 (hereinafter, "Kopf-Sill").

The Patent Office asserts that Kopf-Sill teaches a first fluid path (504) and a second fluid path (510) segregated from the first fluid path (504) by a first convection controller (508) at a first contact region. Applicants do not concede that Kopf-Sill renders unpatentable the claims pending prior to amendment herein. However, solely to advance the patent application process, Applicants have amended independent claim 1 to recite a first contact region comprising an intersection between first and second fluid paths, and a first convection controller segregating the first and second fluid paths and positioned at the first contact region. Such features are not taught or suggested by Kopf-Sill. For example, Applicants do not see how the alleged first convective

controller (508) of Kopf-Sill is positioned at a contact region comprising an intersection between the first fluid path (504) and the second fluid path (510). Accordingly, Kopf-Sill does not disclose each of the limitations recited in claim 1.

Independent claim 29 has been amended to recite a plurality of contact regions *formed at intersections* between at least some of the fluid paths in a first set of fluid paths and at least some of the fluid paths in a second set of fluid paths. As noted above, Applicants do not see where Kopf-Sill teaches or suggests such features.

Independent claim 30 has been amended to recite a second fluid path segregated from a first fluid path by a convection controller positioned at a contact region, *the contact region comprising an intersection* between the first and second fluid paths. As noted above, Applicants do not see where Kopf-Sill teaches or suggests such features.

Independent claim 83 has been amended to require at least one of first or second fluid connecting paths comprising a mixer, which does not appear to be taught or suggested by Kopf-Sill.

For at least the above-described reasons, independent claims 1, 29, 30 and 83 are believed to be patentable in view of Kopf-Sill. The remaining claims each depend, directly or indirectly, from independent claims 1, 29, 30 and 83, and are believed to be allowable for at least the same reasons.

Claims 1, 3, 6, 7, 13, 27, 53, and 54 are rejected under 35 U.S.C. §102(a) and 35 U.S.C. §102(e) as being anticipated by Martin et al., U.S. Patent No. 6,129,973 (hereinafter, "Martin").

The Patent Office asserts that Martin teaches a first fluid path (1310), a second fluid path (1312) segregated from the first fluid path (1310) by a first convection controller (1300) at a first contact region, wherein at least one of the first fluid path (1310) and the second fluid path (1312) has a cross-sectional dimension of less than about 1 mm. Applicants do not concede that Martin renders unpatentable the claims pending prior to amendment herein. However, solely to advance the patent application process, Applicants have amended independent claim 1 to recite a first convection controller segregating the first and second fluid paths and positioned at the first contact

region, *the first convective controller having a cross-sectional dimension perpendicular to the direction of diffusion across the first convective controller of less than about 1 mm*. Applicants do not see where Martin teaches or suggests such features. By contrast, Martin appears to disclose a microporous contactor sheet 1300 having a cross-sectional dimension perpendicular to the direction of diffusion across it that is much greater than the size of fluids paths 1310 and 1312, and therefore much greater than about 1 mm (e.g., see Figure 6), which would be advantageous for the applications disclosed in Martin (e.g., to increase surface area for mass transfer and mixing). Accordingly, Martin does not disclose each of the limitations recited in claim 1.

For at least the above-described reasons, independent claim 1 is believed to be patentable in view of Martin. The remaining claims each depend, directly or indirectly, from independent claim 1, and are believed to be allowable for at least the same reasons.

Independent claim 53 and its depending claims have been cancelled, thus rendering the rejection of these claims moot.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on these grounds.

#### **Rejection of Claims under 35 U.S.C. §102 and §103**

Claims 1, 3, 6-9, 11-21, 27, 53, 54, 62 and 63 are rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over Hediger et al., "Biosystem for the Culture and Characterization of Epithelial Cell Tissues", 63 Sensors and Actuators B, 63-73 (2000), (hereinafter, "Hediger"). Alternatively, claims 1, 3, 6-9, 11-21, 27, 53, 54, 62 and 63 are rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over Hediger as evidenced by Beattie, "The Intrinsic Charge on Hydrophobic Microfluidic Substrates", 6 Lab Chip 1409-1411 (2006) (hereinafter, "Beattie").

The Patent Office asserts that Hediger teaches a first fluid path (top reservoir) and a second fluid path (bottom reservoir) segregated from the first fluid path by a first convection controller (polycarbonate membrane) at a first contact region, wherein at least one of the first fluid path and the second fluid path has a cross-sectional dimension of less than about 1 mm. Applicants do not concede that Hediger renders unpatentable the claims pending prior to amendment herein. However, solely to advance the patent application process, Applicants have amended independent claim 1 to recite first and second substantially enclosed fluid paths. By contrast, Hediger discloses a first fluid path (top reservoir) being in an open configuration (see, for example, Figures 1(a), 2, 3(j), 4(i), 6(a) bottom, and 8(a, b)); therefore, Hediger does not disclose each of the limitations recited in amended claim 1.

As described in Hediger, the open configuration of the first fluid path (top reservoir) allows access to the reservoir during cell growth, as well as a larger holding capacity for fluids. For example, page 69, right column of Hediger discloses a “PDMS reservoir attached onto the top silicon wafer, allowing the application of sufficient physiological fluid during the growth of the epithelial layer.” Page 66, left column discloses “a top removable reservoir, made out of the elastomer Polydimethylsiloxane (PDMS), which is needed for providing a sufficiently large quantity of biological solution”. Since Hediger requires access to the reservoir during cell growth to replenish physiological fluids, Hediger in fact teaches away from devices having substantially enclosed fluid paths; therefore, it would not be obvious to modify Hediger to include first and second substantially enclosed fluid paths as recited in amended claim 1.

Furthermore, claim 1 has been amended to include a first convection controller segregating the first and second fluid paths and positioned at the first contact region, *the first convective controller having a cross-sectional dimension perpendicular to the direction of diffusion across the first convective controller of less than about 1 mm*. Applicants do not see where Hediger teaches or makes obvious such features. By contrast, Hediger discloses on page 65, second column, that the surface of a single culture device (determined by the free area of the membrane) is between 1 and 4 mm<sup>2</sup>. A reason for including a free area of the membrane that is between 1 and 4 mm<sup>2</sup>, in contrast to an area of less than 1 mm<sup>2</sup> as recited in claim 1, would be to have a larger area for cell growth

and a larger volume for holding physiological fluids, as noted above. Accordingly, it would not be obvious to modify Hediger to include the limitations recited in amended claim 1.

As noted above, independent claim 53 and its depending claims have been cancelled, thus rendering the rejection of these claims moot.

Independent claim 62 has been amended to recite the steps of flowing at least a portion of a first fluid from a first fluid source into a first fluid path, partitioning portions of a second fluid from a second fluid source into each of second and third fluid paths, mixing at least a portion of the first fluid with the portion of second fluid in the second fluid path to form a third fluid, and mixing at least a portion of the third fluid with the portion of second fluid in the third fluid path to form a fourth fluid. Applicants do not see where Hediger teaches or makes obvious such steps.

Furthermore, Beattie does not teach or suggest the limitations missing in Hediger for each of independent claims 1 and 62. Therefore, even if one combined the teachings of Hediger in view of Beattie in the manner stated in the Office Action, all of the recited features in each of independent claims 1 and 62 would not be taught or suggested. Thus, independent claims 1 and 62, and the claims that depend therefrom, are patentable over the asserted combination of Hediger in view of Beattie.

Claims 1, 3, 6, 7, 13, 15-17, 53, and 54 are rejected under 35 U.S.C. §102(a) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over Gao et al., "Integrated Microfluidic System Enabling Protein Digestion", Peptide Separation and Protein Identification, 73 Anal. Chem., 2648-2655 (2001) (hereinafter, "Gao").

The Applicants do not concede that Gao contains subject matter that creates a *prima facie* position of unpatentability of any of claims 1, 3, 6, 7, 13, 15-17, 53, and 54; however, solely to advance the patent application process, the Applicants submit herewith a Declaration under 37 C.F.R. §1.131 and an accompanying exhibit that establish reduction to practice of subject matter of at least claims 1, 3, 6, 7, 13, 15-17, 53, and 54 before the effective date of Gao, April 28, 2001 (date

of publication on Web), thereby establishing an invention date for the invention as claimed in at least claims 1, 3, 6, 7, 13, 15-17, 53, and 54 that is before the effective date of Gao. Accordingly, since Gao cannot be applied as a reference with respect to claims 1, 3, 6, 7, 13, 15-17, 53, and 54, it is respectfully requested that the rejection of these claims be withdrawn in view of the non-availability of Gao.

Claims 53-64 and 77 are rejected under 35 U.S.C. §102(e) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over Kopf-Sill.

As noted above, independent claim 53 and its depending claims have been cancelled, thus rendering the rejection of these claims moot.

As noted above with respect to Hediger, independent claim 62 has been amended to recite the steps of flowing at least a portion of a first fluid from a first fluid source into a first fluid path, partitioning portions of a second fluid from a second fluid source into each of second and third fluid paths, mixing at least a portion of the first fluid with the portion of second fluid in the second fluid path to form a third fluid, and mixing at least a portion of the third fluid with the portion of second fluid in the third fluid path to form a fourth fluid. Applicants do not see where Kopf-Sill teaches or makes obvious such steps. For instance, it is not clear to Applicants how the devices described in Kopf-Sill could be modified to perform such steps as required by claim 62, or why one would be motivated to do so.

For at least the above-described reasons, independent claim 62 is believed to be patentable in view of Kopf-Sill. The remaining claims each depend, directly or indirectly, from independent claim 62, and are believed to be allowable for at least the same reasons.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on these grounds.

**Rejection of Claims under 35 U.S.C. §103**

Claims 1, 2, 4, 5, 10, 22-26, 28, 29, 53-65, and 85 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hediger.

As noted above, the Applicants believe that Hediger does not teach or make obvious the limitations recited in independent claims 1 and 62. The remaining claims each depend, directly or indirectly, from independent claims 1 and 62, and are believed to be allowable for at least the same reasons.

Independent claim 28 has been amended to recite first, second, third and fourth substantially enclosed fluid paths. The claim also requires a convection controller positioned at the intersections of the substantially enclosed fluid paths. These limitations are not taught or made obvious by Hediger for the reasons described above in connection with claim 1.

Independent claim 29 has been amended to recite first and second sets of fluid paths that are substantially enclosed. For at least the same reasons mentioned above in connection with claims 1 and 28, the Applicants believe that it would not be obvious to modify Hediger to include each of the limitations recited in claim 29.

Claims 1, 2, 4, 5, 6, 9-12, 18-36, 53-65, 77 and 85 are rejected under 35 U.S.C. §103(a) as being unpatentable over Gao.

As noted above, the Applicants believe that Gao is removed as an applicable reference with respect to claims 1, 2, 4, 5, 6, 9-12, 18-36, 53-65, 77 and 85. Accordingly, since Gao cannot be applied as a reference with respect to the above-noted claims, it is respectfully requested that the rejection of these claims be withdrawn in view of the non-availability of Gao.

Claims 1, 3, 22, 24-28, 30, 31, 65 and 85 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kopf-Sill.

As noted above, the Applicants believe that Kopf-Sill does not teach or make obvious the limitations recited in independent claims 1, 62 and 83. The remaining claims each depend, directly or indirectly, from independent claims 1, 62 and 83, and are believed to be allowable for at least the same reasons.

Claims 1, 2, 4, 5, 9-12, 14-17, 30-36, 53-65 and 85 are rejected under 35 U.S.C. §103(a) as being unpatentable over Martin. Alternatively, claims 1, 2, 4, 5, 9-12, 14-17, 30-36, 53-65 and 85 are rejected under 35 U.S.C. §103(a) as being unpatentable over Martin as evidenced by Hediger.

As noted above, Applicants do not see where Martin teaches or makes obvious a convective controller having a cross-sectional dimension perpendicular to the direction of diffusion across the first convective controller of less than about 1 mm. By contrast, Martin appears to disclose a microporous contactor sheet 1300 having a cross-sectional dimension perpendicular to the direction of diffusion across it of much greater than the size of fluids paths 1310 and 1312, and therefore much greater than about 1 mm (e.g., see Figure 6), which would be advantageous for the applications disclosed in Martin (e.g., to increase surface area for mass transfer and mixing). In other words, since the devices in Martin are used for applications that benefit from the microporous contactor sheet having a large surface area, one would not be motivated to make a cross-sectional dimension of the microporous contactor sheet small, e.g., less than about 1 mm.

As noted above, independent claim 53 and its depending claims have been cancelled, thus rendering the rejection of these claims moot.

As noted above, independent claim 62 has been amended to recite several steps involving partitioning and mixing. The Applicants do not see how the devices in Martin could be modified to perform such steps as required by claim 62, or why one would be motivated to do so.

For at least the above-mentioned reasons, the Applicants believe that Martin does not teach or make obvious the limitations recited in independent claims 1 and 62. The remaining claims each depend, directly or indirectly, from independent claims 1, and 62, and are believed to be allowable for at least the same reasons.



Furthermore, Hediger does not teach or suggest the limitations missing in Martin for each of independent claims 1 and 62. Therefore, even if one combined the teachings of Martin in view of Hediger in the manner stated in the Office Action, all of the recited features in each of independent claims 1 and 62 would not be taught or suggested. Thus, independent claims 1 and 62, and the claims that depend therefrom, are patentable over the asserted combination of Martin in view of Hediger.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on these grounds.

#### **New Claims**

New claims 90-109 have been added, each of which are supported in the specification as filed. New claims 90-109 each depend, directly or indirectly, from independent claims 1, 30, or 83 which are believed to be patentable for the reasons noted above. No new matter has been added.

CONCLUSION

Claims 1-5, 7-32, 34-36, 62-64, 77, 83-85, and 90-109 remain pending. Because the pending claim set contains not more than 13 independent and 89 total claims (the highest number for which fees have been paid), no excess claim fees are due with this submission. However, if a fee is due, please charge our Deposit Account No. 23/2825 under Docket No. H0498.70190US00 from which the undersigned is authorized to draw.

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Respectfully submitted,

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